INTERNATIONALISATION OF THE MILITARY TECHNICAL EDUCATION

Cristian-Emil Moldoveanu, Alin Constantin Sava

Military Technical Academy „Ferdinand I", Bucharest, ROMANIA, cristian.moldoveanu@mta.ro

Abstract: *The most important universities have as objectives the increasing of the internationalization of higher education and the development of student, teaching staff and researchers' mobility, as well as the international compatibility of bachelor's, master and PhD study programs. Although the functioning of the technical military higher education institutions is subject to further limitations imposed by the rigors of the military system, its connection to the quality requirements of the European system is a necessity as well as a reality. While for the students of civil universities Erasmus mobility represents an opportunity to increase their employability chances, for military students Erasmus mobility represents the chance to gain international experience which, along with the new skills and knowledge acquired, provide them a better adaptation to fit into a new, international and multicultural environment. The article presents also important results obtained within two Erasmus+ strategic partnership projects.*

Keywords*: Internationalization; Military Education; Erasmus+ ; International Mobilities* .

1. Introduction

Military Technical Academy "Ferdinand I", Bucharest (MTA Bucharest) is a polytechnic higher education military institution having as mission the training of engineer officers for the Ministry of National Defense and for other beneficiaries from the national system of defense, public order and national security. MTA is organized in 4 faculties: *Fac. A: Integrated Armament Systems, Military Engineering and Mechatronics, Fac. B: Aircraft and Military Vehicles, Fac. C: Informatic Systems and Cybernetic Security, Fac. E: Communications and Electronic Systems for Defence and Security* and one independent department: *Foreign Languages, Military Science and Management*.

MTA Bucharest conducts higher education study programs organized in undergraduate, master and doctoral studies in its accredited fields and specializations, and other forms of training, perfecting and specialization: *Armament, Ammunition and Missiles Engineering, Aerospace Engineering, Automotive Engineering, Military Engineering, Civil Engineering, Geomatics, Electronic Engineering, Telecommunication and Information Technology, Computers and Information Technology, System Engineering*. Regarding international relations, MTA conducts mobility of students, by sending its own students to foreign military and civilian universities and by receiving foreign students.

Mobility of students target undergraduate, master and PhD exchange programs studies, the development of bachelor, master and PhD projects and theses, the development of strong collaborations and, specific for military institutions, training sessions including military activities. Professors and

research personnel conduct research and teaching activities in foreign military and civilian partner universities.

2. Erasmus+ and Military Erasmus Student and Staff Mobility Projects

MTA Bucharest has been taking part in mobility programs such Erasmus since 1998. MTA Bucharest conducts mobility of students, by sending its own students to foreign military and civilian universities and by receiving foreign students. Mobility of students target undergraduate, master and PhD exchange programs studies, the development of bachelor, master and PhD projects and theses, the development of strong collaborations and, specific for military institutions, training sessions including military activities. Professors and research personnel conduct research and teaching activities in foreign military and civilian partner universities. In each year, MTA Bucharest sends about 70 students abroad (50 bachelor students, 15 master students and 5 PhD students) in Erasmus+ mobilities (SMP or SMS) and receives about 20 foreign students. In the same time, about 30 staff mobilities are realized in each year (10 for teaching and 20 for training). About 10 foreign teachers take part in mobility in MTA Bucharest every year. In general, Erasmus mobilities of students and teachers were conducted in military and civilian universities, and sometimes in research civilian institutions with technical concerns.

In general, Erasmus mobilities of students and teachers were conducted in military and civilian universities, and sometimes in research civilian institutions with technical concerns. In the framework of Erasmus+ program, MTA Bucharest has inter-institutional agreements with:

- military academies: Military University of Technology of Warsaw, Poland, Military Academy of Land Forces Wroclaw, Poland, Royal Military Academy Brussels, Belgium, National Defense University of Brno, Czech Republic, National Military University „Vasil Levski", Bulgaria, ENSTA Bretagne, Brest, France, ENSTA ParisTech, Paris, France, ESM Saint-Cyr Coetquidan, France, National University of Public Service, Hungary, Military Academy Liptovsky Mikulas, Slovakia etc

- civilian universities: University of Ostrava, Czech Republic, University of Pardubice, Czech Republic, University New Bulgarian, Bulgaria, University of Applied Science Zagreb, Croatia, University of Limerick, Ireland, University of Pisa, Italy, University "Tor Vergata" of Rome, Italy, University of Angers, France, UBO Brest, France, ENI Brest, France, INP Grenoble, France, University Aix-Marseille, France, University Haute Alsace of Mulhouse, France, Polytechnic University of Nantes, France, University of Pau, France, INSA Rennes, France, University Paul Sabatier of Toulouse, France, INP Toulouse, France, ECAM Strasbourg, France, University of Stuttgart, Germany, Technological Educational Institute of Crete, Greece, Technical University of Riga, Latvia, University of Technology Koszalin, Poland, University of Coimbra, Portugal, NOVA University of Lisbon, Portugal, UPC Barcelone, Spain, University of Basque Country Bilbao, Spain, Polytechnic University of Madrid, Spain, Polytechnic University of Cartagena, Spain etc.

- research institutes: OZM Research, Czech Republic, German Aerospace Center, Germany, NATO Communications and Information Agency, Hague, The Nederlands, EDF Laboratory, Paris, France etc

At the same time, MTA is involved within the European Initiative for the Exchange of Military Young Officers Inspired by Erasmus (EMILYO - Military Erasmus Initiative). Within this initiative MTA send students to take part in the common modules organized by other European military

academies and organize also common modules and international semesters taught in English open for military and civilian students from abroad.

One of the EMILYO lines of development, dedicated to the international technical semester is coordinated by the MTA representative and already produced two important results: an Erasmus+ Strategic partnership project *European Common Technical Semester for Defence and Security* (coordinated by Military Technical Academy "Ferdinand I" of Romania, in partnership with Military University of Technology of Poland, "Vasil Levski" National Military University of Bulgaria, Hellenic Air Force Academy of Greece and French Air Force Academy of France) and an Erasmus+ Strategic partnership project *Digital Competences for Improving Defence and Security Education* (coordinated by Military University of Technology of Poland, in partnership with, Military Technical Academy "Ferdinand I" of Romania , "Vasil Levski" National Military University of Bulgaria and University of Turin from Italy).

3. International Semester "Defence and Security Technical Systems"

The project of an international semester on military technical education was started in 2018 and was for the first time organized in the 2019 in the Military Technical Academy "Ferdinand I" of Bucharest. The teaching objective of the semester is to prepare the participants for the acquisition of professional and transversal competencies that allow them to develop projects in the field of technical defence and security systems in international, multidisciplinary and multicultural teams. The semester consists in 3 parts: core curriculum, scientific project and military training.

The core curriculum is followed by all the students enrolled in the international semester. In this part there are common subjects useful for all the engineering braches (Project Management, Methods and Tools of Modeling and Simulation of Technical Systems, Sensors, Acquisition and Data Processing Systems, Intercultural and Professional Communication etc).

The military training part consists in subjects related to the military science such as Armament Systems, Electronic Warfare, Cyber Security Elements, Sport and Physical Training etc This part is followed by all the military students enrolled in the international semester.

The scientific project is the most important part of the international semester. In this part a project is performed by a multi-national and multi-disciplinary team of 3 to 6 students. In the beginning of the semester, the available projects are presented after which the students are given the opportunity to give their preferences for which project they want to participate in. The students are then divided into teams in the beginning of the semester based on their own preferences, major studies, and nationality. The aim is to have a good mix of both nationalities and competences in each team. The main objective is to train students from different countries and different disciplines to work together in multi-cultural and multi-disciplinary groups.

The students work together to execute an integrated engineering project, focusing on the development of personal competences, especially the ability to work and communicate within cross-cultural groups and on the interrelated work of several disciplines like mechanical, electrical engineering, information technology, aerospace engineering, armament engineering etc. Every week they have a plenary meeting during which time the teams present their progress of the work and receive

help and guidance as well the new direction of the projects. At the end of the semester there should be a written final report from each team. In the final presentation all the team-members are expected to participate on equal terms.

In the first spring international semester organized in the Military Technical Academy "Ferdinand I" were enrolled 15 students: 9 military students from Military University of Technology, Warsaw, Poland (5 cadets), "Vasil Levski" National Military University, Bulgaria (1 cadet) and Military Technical Academy "Ferdinand I" of Bucharest, Romania (3 cadets) and 6 civilian students from IUT "Paul Sabatier" Toulouse, France. They were divided in 3 teams: weapon systems, aerospace engineering and military engineering.

The editions from 2020 and 2021 were canceled due of the COVID-19 pandemic evolution, but Military Technical Academy "Ferdinand I" intends to organize the second edition in the period March-June 2022.

4. European Common Technical Semester for Defence and Security

The project "***European Common Technical Semester for Defence and Security***" (2020-1-RO01-KA203-080375) is funded by the European Commission in the framework of the Erasmus+ Programme, KA203 Strategic Partnership for Higher Education (https://www.euctsds.eu/).

The project consortium consists of the following institutions: *Military Technical Academy „Ferdinand I", Romania* (**MTA**: coordinator); *Military University of Technology, Warsaw, Poland* (**MUT**); *Hellenic Air Force Academy, Athens, Greece* (**HAFA**); *French Air Force Academy, Salon de Provence, France* (**FAFA**); *"Vasil Levski" National Military University, Bulgaria* (**NMU**). The European Security and Defence College from Brussels joined the project as associated partner.

The idea of the project was born in the frame of European Initiative for the Exchange of Young Officers Inspired by Erasmus (EMILYO or Military Erasmus, http://www.emilyo.eu/), an initiative undertaken by the European Union member states aimed at developing the exchanges between armed forces of future military officers as well as their teachers and instructors during their initial education and training. One of the Lines of Developments of the EMILYO is dedicated to the International Technical Semester (LoD-13), officially started in 2019 and having as objectives the development of a common international semester for the future engineers acting in the field of defence and security systems.

The main issues identified are the lack of offers with classes taught in English for military students in the engineering branches. From that reason for students coming from military technical academies or from technical faculties of the military academies is very difficult to find options to improve their competencies and to have international experiences in a fully recognized context. Sometimes, they can take part in international semester organized in civilian universities, but without military components, or to take part in internships for preparing their final project diploma.

The project will contribute to increase the number of the military students with international experiences and intends to fill a gap in the field of the international relations related to the defence and security higher technical education institutions, by preparing an international technical semester for military students with technical background, but also accessible to civilian students interested in formation in defence and security technical systems. The other priorities identified is to mitigate the lack

of a network of teachers with competencies in technical systems for defence and security and of a common digital platform useful to collaborate in order to prepare classes and to teach, and also to us new digital technologies tools to improve the quality of the teaching activities and of the scientific research activities.

The goals of the ***European Common Technical Semester for Defence and Security (E_uCTS_{DS})*** project are the development, designing and testing of a new modular curriculum for an international technical semester for defence and security, at bachelor level, common at European Union, and also the development of a network of teachers with competences in the field of technical systems for defence and security.

The **main objectives** of the project are: to design and develop a new European common technical semester curriculum, in the field of defence and security; to create a network of teachers in the field of technical systems for defence and security; to elaborate the subjects description for the new international technical semester; to elaborate the education materials for the new international technical semester; to elaborate a methodology of the organization and of the evaluation of the interdisciplinary scientific project, using the project based learning method; to develop an e-learning platform for the international technical semester; to organize the intensive study programmes for teachers and students in order to test the modules of the new designed international technical semester and to identify the improvement possibilities of the curriculum, subject descriptions, didactic materials and of the e-learning platform; to ensure the management and the implementation of the project; to disseminate the results of the project; to ensure the sustainability of the project.

The subjects that will be included in the new international technical semester are: *Applied Informatics, Applied Automation for Engineering Systems, Integrated Weapon Systems* and *Common Security and Defence Policy for Technical Systems* (common subjects for all the engineering branches), *Computer Networks, Programming Languages, Signal Processing* and *Microcontrollers* (subjects for electronics and computer science engineering branches), *Propulsion Systems, Dynamic of Flight, Mechanics and Material Science* and *Computer-Aided-Design and Numerical Analysis* (subjects for mechanical engineering and aerospace engineering branches), *Interdisciplinary Scientific Project, Foreign Languages (Bulgarian/French/Greek/Polish/Romanian)* and *Physical Education and Sports* .

The development of the project will last two years and the implementation of the new curriculum is expected to take place in the 2022 - 2023 academic year.

5. Digital Competences for Improving Defence and Security Education

The project "*Digital Competences for Improving Defence and Security Education*" (**2020-1-PL01-KA226-096192**) is funded by the European Commission in the framework of the Erasmus+ Programme, KA226 Strategic Partnership for Higher Education (https://www.euctsds.eu/).

The project consortium consists of the following institutions: *Military University of Technology, Warsaw, Poland* (**MUT: coordinator**); *Military Technical Academy „Ferdinand I", Romania* (**MTA**); *"Vasil Levski" National Military University, Bulgaria* (**NMU**) and *University of Turin, Italy* (**UniTo**).

The aim of the DIGICODE project is to improve the security and defence education quality by using digital tools in the didactic activities and by developing digital competences of teachers. The main objectives of the project are: to conduct a survey and collecting detailed information in a group of

students and lecturers from international universities and to conduct a comparative analysis in order to compare the processes, strategies, and methods used by the respondents and to identify the best practices and competencies ensuring safe and effective online teaching in Security and Defence; to develop a Best Practices Handbook, including a collection of best practices and solutions used by universities in the times of COVID-19; to develop a teacher tool-kit including a toolkit for digital competences for teachers in the Security and Defence field and open online training courses to support teachers and trainers in using specific digital learning environments for education, different kinds of digital tools, and in adopting innovative and adaptive methodologies like problem solving, problem-based teaching, learning by doing, formative and data-driven automatic assessment with interactive and immediate feedback, collaborative learning, team working; to design and develop a curriculum for a summer school "*Systems for Command and Control in Security and Defence Field*" which plays a critical role in helping teachers to have an integrated vision of the security and defence education system; to apply the teacher tool-kit prepared especially for the digital education in order to explain the systems functionality, replacing the classic laboratory activities; to improve the digital competences and to improve the communication skills in online environment of at least 16 teachers and 16 students from security and defence education institutions; to build the critical mass of knowledge and resources in partner institutions in order to foster the use of digital education in military academies.

The main activities of the project will consist in 4 transnational meetings, 5 intellectual outputs, 2 multiplier events, 2 staff training editions for improvement the technical competences and communication skills for digital education and 2 summer schools in digital education for learners "Systems for Command and Control in Security and Defence Field". The project activities will be organized in 8 work packages: WP 1 - Needs Analysis; WP 2 – Benchmarking digital competences in Security and Defence education and elaboration of Best Practices Handbook; WP 3 – Teacher tool-kit for digital learning in security and defence education; WP 4 – Summer School Design; WP 5 – Cybersecurity in Digital Education; WP 6 – Pilot Summer School Implementation; WP 7 – Development of Report on participants' experiences and lessons learned after the trial digital education; WP 8 – Dissemination.

As a result of the activities implemented, we expect to produce sustainable results among the participants and the organizations involved, that could be translates into a better capacity of the teachers to face the challenges of the digitalization and of the digital learning in security and defence education system.

The Best Practices Handbook, the methodology for the cybersecurity requirements, the teacher tool-kit and the teacher digital workbook and all other outputs created within the project will support the context for the future organization of the staff training activities and summer schools for students in order to improve the teachers and students digital competences and communication skills in online environment applied to the security and defence education system. The development of the project will last two years, in the period May 2021 – April 2023.

6. Conclusions

Although the majority of bachelor, master or PhD projects could be developed in MTA, it appears that by conducting international mobility, the student will improve considerably his knowledge and professional skills by having the chance to observe, during his international mobility, a new approach to the professional project content. International mobility is a first test for students to see if the knowledge and skills gained while studying in MTA are effective. It was found that over 95% of MTA students fared in good condition and proved very good competences and knowledge during international mobilities; professors responsible for their evaluation constantly appreciated their work with high and very high grades. International recognition strengthens the students' confidence level and professional skills and validates high MTA education quality and competitiveness.

MTA has the necessary number of specialized technical laboratories, but is limited in terms of endowment with specialized modern equipment and devices for civilian and military applications. Through internships abroad, students have the opportunity to work with similar or more modern software programs, equipment and devices which sometimes are not found in MTA laboratories. This is a great advantage for MTA students, because during Erasmus stages they gain access to a large number of modern laboratory equipment useful in their field of study. At the same time the student will have the chance to learn the construction and mode of operation of new or similar equipment, which is a challenge. This is an advantage for students who carry out activities abroad. Basically, by means of Erasmus mobility, students will have a very large number of specialized technical equipment and laboratories to perform their projects, improving their knowledge and skills gained in MTA. Another aspect that should not be overlooked is the fact that during mobility, the student accumulates knowledge and skills complementary to those ensured by the educational program of MTA, which leads to an increase of the professional level of the student.

The strategy of internationalization of military higher education in MTA includes the promotion of an international culture through: promoting cooperation with prestigious civilian and military institutions of higher education abroad, including both the research sector and that of businesses, as part of efforts to build a fully functioning knowledge triangle (education - research - innovation); encouraging and supporting outgoing and incoming mobility of students, professors and researchers; perfecting the competencies of students, professors, researchers and of other types of personnel needed to work in an open international environment; ensuring the supply of high quality curricula and teaching methods applied taking into consideration the international dimension; create an institutional environment that encourages the participation of students, professors and researchers in international programs and international research projects; implementing the concept of internationalization at home: this involves the integration of the international dimension in everything that means life and academic work.

The participation of MTA within the Erasmus+ strategic partnerships in the period 2020-2023 will improve the internationalization of higher education and of the scientific research and will have a high impact of the future institutional quality improvement of the education system and an the international recognition.

References

[1] **Jane Knight**, *Internationalization: Key Concepts and Elements*, University of Toronto, Canada, 2004;

[2] **Harald Gell, Sylvain Paile-Calvo, Symeon Zambas,** *European Education and Training for Young Officers. European Initiative for the Exchange of Young Officers , Inspired by Erasmus*, 2nd Edition, Austria, 2018;

[3] **Moldoveanu Cristian-Emil.**, **Edu Ioana Raluca, Rotariu Traian, Andruseac Gabriela,** *The Impact of Erasmus Mobility on Military Technical Higher Education*, Proceedings of the 9th International Technology, Education and Development Conference, INTED 2015, pp. 4233-4238, ISSN 2340-1079, ISBN: 978-84-606-5763-7, Madrid, Spain, 2-4 March 2015.